example of high accuracy detection using cable provided with high EM contrast material according to the present disclosure is also shown in Table 4, as seen when detecting Cable 2, which is also arranged on the thin wall side of the wellbore tubular. The detection tool in this case finds the cable in its true location. I.e. the cable provided with high EM contrast material according to the present disclosure allows to reduce the error margin to below 5 degrees, or even to below 1 degree (radially).

TABLE 4

Test configuration: Cable arranged diametrically opposite the heavy-wall side of a tubular
Scale: Total Metal Mass: about 2000-8000 Counts
True cable placement angle = 68 degree

	High Count	Low Count	Total Counts	Reported Angle	Error
Cable 1: Narrow LPC	3549	3367	182	350	−78
Cable 2: 0.25" Mu-Metal	4816	2385	2431	68	0

[0129] FIG. **19** shows how the counts on the DC-MOT increase with increasing Target-to-background ratio. For the improved LPC Cable with mumetal strips **11** having a width of about 0.25" (entry **500**) or 0.5" (entry **502**), the ratio of target and background (based on ratios of respective EIm values for device to be detected and background (such as casing) over de width of the device, such as cable) is 44 and 89, respectively. This is significantly higher than 0.25 (entry **504**) for a conventional cable provided with regular steel reinforcement bars. As mentioned, the wall of a typical oilfield tubular according to API specifications may have a tolerance in wall thickness of up to −12.5%, potentially leading to counts and a (false positive) detection signal of the heavy wall side as well (entry **506** in FIG. **19**).

[0130] The diagram of FIG. **19** can be used to design an application specific cable, for instance based on trend line **510**. In a practical embodiment, the ratio of target-to-background signal (based on ratios of respective EIm values for device to be detected versus the background over the width of the device, or over the azimuthal angle covered by the device if it is arranged with respect to a tubular) indicates the accuracy to be expected.

[0131] A cheaper alternative to mumetal with similar characteristics—Electrical grade steel—was also tested. The cable **10** in FIG. **8** was assembled with Electrical Steel bars (0.125"×0.5"), and accurately located (error below 5 degrees off radially in a worst case scenario). While the electrical steel has lower EM contrast than mu-metal, the performance, in terms of recorded counts, on the DC-MOT was the same. The accuracy could be tuned above a threshold, similar to mumetal, using sufficient number of laminae For instance, an electrical steel bar assembled using about 9 laminae provided similar results as a cable comprise about two laminae made of mumetal.

[0132] Essentially due to skin effect, the DC-MOT is only interrogating small thickness of the bulk material. The skin depth (δ) of interrogation is calculated as:

$$\delta=1/\sqrt{\pi f \sigma \mu_r}$$

wherein f is the frequency of EM radiation, μ_r is relative magnetic permeability and σ is electrical conductivity.

[0133] For instance, at 60 Hz, the skin depth for mumetal (for instance as provided by Amumetal Manufacturing Corp. [US]) and electrical steel is about 0.006" and 0.018", respectively. While for Amumetal the skin depth may be much smaller than the laminae thickness—0.06"—it may be approximately the same as the laminae thickness in the case of electrical steel. If the laminae were perfectly insulated, the cable with electrical steel would have resulted in better response than a cable provided with a laminated mumetal layer.

[0134] While the above may refer to specific examples of hydraulic, electrical, or fiber optic cables, it will be clear to the skilled person that these cable types are interchangeable within the context of including the high magnetic permeability material. The cable may also take the form of a combined cable, which may comprise any combination of multiple types of lines, such as, for example, electric and fiber optic lines, or hydraulic and fiber optic lines.

[0135] The person skilled in the art will understand that the present invention can be carried out in many various ways without departing from the scope of the appended claims.

[0136] Summarizing various aspects and embodiments, the present disclosure further descibes a system for providing information through a metal wall, the system comprising a device adapted to be arranged on one side of the metal wall; and a magnetic-permeability element, provided at, near or connected to the device, comprising a material having a relative magnetic permeability μ_r of at least 2000. The material may have an EM contrast ratio of 20 $\mu\Omega^{-1}\cdot cm^{-1}$ and above, wherein EM contrast is defined as μ_r/ρ. The material may have an EM contrast ratio of at least 50 $\mu\Omega^{-1}\cdot cm^{-1}$. The metal wall may be the wall of a wellbore tubular. The device may be a cable, such as a fiber optic cable. The material may have a relative magnetic permeability of at least 8,000, preferably of at least 20,000; and/or a resistivity of at least 30 μΩ·cm, preferably of at least 37 μΩ·cm. The material may be selected from the group of: mu-metal, permalloy, and non-oriented electrical steel.

[0137] The present disclosure further descibes a use of such a system for providing information through a metal wall. The use may comprise arranging a device on one side of the metal wall; and arranging a magnetic-permeability element at, near or connected to the device, the magnetic-permeability element comprising a material having a relative magnetic permeability μ_r of at least 2000. The use may further comprise activating a magnetic orienting tool on an opposite side of the metal wall to locate the magnetic-permeability element on said one side of the metal wall. The magnetic-permeability element may be optimized using equivalent inductive mass (EIm), EIm being defined as mass·μ_r·σ. A target-to-background EIm ratio may be selected to exceed 5. The magnetic-permeability element be by optimized, wherein the target-to-background ratio is selected to exceed 15.

[0138] It is finally summarized, that the magnetic permeability material as described herein may also be employed to inductively couple the device to a power supply. This allows the power supply and the device to be separated by a metal wall. This may be combined with a rechargeable battery within the device which can be inductively charged. This may be employed, for example, to power sensors comprised in the device.